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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2019 Missile Defense Agency **Date:** February 2018

<b>Appropriation/Budget Activity</b> 0400: Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)	<b>R-1 Program Element (Number/Name)</b> PE 0604115C / Technology Maturation Initiatives
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COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	24.743	84.514	128.406	148.822	-	148.822	172.423	143.240	143.938	174.770	Continuing	Continuing
MD98: Directed Energy Demonstrator Development	-	14.265	48.099	61.317	-	61.317	66.266	60.697	70.704	72.040	Continuing	Continuing
MD99: Discrimination Sensor Demonstrator Development	18.362	56.988	73.295	78.608	-	78.608	94.217	74.068	66.263	94.528	Continuing	Continuing
MT99: Technology Maturation Initiatives Test	2.070	8.434	0.220	1.982	-	1.982	4.285	1.839	0.000	0.000	0.000	18.830
MC98: Cyber Operations	0.140	0.331	0.172	0.254	-	0.254	0.177	0.180	0.270	0.275	Continuing	Continuing
MD40: Program Wide Support	4.171	4.496	6.620	6.661	-	6.661	7.478	6.456	6.701	7.927	Continuing	Continuing

**Program MDAP/MAIS Code:** 362

**Note**

N/A

**A. Mission Description and Budget Item Justification**

Technology Maturation Initiative (TMI) develops technology that is matured beyond the laboratory. TMI focuses on improved accuracy, adding range, and conducting operationally representative airborne sensor tests using MDA Configured MQ-9 Remotely Piloted Aircraft (RPA), equipped with advanced sensors (tracking lasers, advanced detectors, infrared sensors, and precision tracking and discrimination algorithms). It incorporates industry technology breakthroughs to develop and demonstrate low to mid power lasers on a high altitude airborne platform. Together, these advanced components and tests address complex tracking, discrimination, and boost phase kill challenges for the Ballistic Missile Defense System (BMDS) in support of the Strategic Commands Prioritized Capabilities List and address evolving threats to the homeland from the Pacific theater.

MDA will develop cost effective technology demonstrators to address specific risks:

- A high altitude low power laser equipped airborne system to demonstrate finding, tracking and engaging boosting missiles at the standoff ranges required for missile defense
- An advanced sensor integrated into a MDA Configured MQ-9 to provide discrimination of lethal objects
- An advanced sensor space payload that builds on the airborne discrimination program to demonstrate persistent overhead discrimination coverage
- Continuation of testing of the passive MDA Configured MQ-9 system to validate performance against emerging advanced threats

The Low Power Laser Demonstrator (LPLD) program integrates a tracking laser with a more powerful mission laser and larger beam control system on a high altitude airborne platform. This airborne demonstrator addresses a broad spectrum of directed energy mission applications while refining a missile defense concept of operations

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doctrine for incorporating lasers into the BMDS. MDA's directed energy plan incrementally demonstrates and improves the constituent components required to execute a directed energy kill chain; acquisition, tracking and lethality. The Agency will select from industry concepts to integrate and test a low to mid power laser on a high altitude airborne platform. The LPLD shapes future BMDS acquisition choice by advancing and citing the technology readiness levels of emerging and developing technology, while simultaneously assessing the performance and contributions to the BMDS architecture.

The MDA Configured MQ-9 provides a low cost, mid-altitude unmanned test platform capable of carrying small laser and advanced sensor payloads. This platform allows MDA to introduce unmanned systems and tracking lasers into the BMDS, develop the associated concept of operations and provide the basis for a quick reaction precision tracking capability to augment radar. The advanced sensor incorporates incrementally developed, integrated, and tested next-generation sensors and detectors to demonstrate Launch-on-Remote, Engage-on-Remote, discrimination and handover improvements for missile defense first from the air and then from space. These advanced sensors improve the probability of engagement success for stressing threats, expand the BMD battle space and increase the ability to negate larger raid sizes.

To address emerging advanced threats, MDA may use MDA-configured MQ-9s to support hypersonic threat testing scenarios.

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>
Previous President's Budget	99.366	128.406	168.388	-	168.388
Current President's Budget	84.514	128.406	148.822	-	148.822
Total Adjustments	-14.852	0.000	-19.566	-	-19.566
• Congressional General Reductions	-3.874	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.878	0.000			
• FY 2017 Request for Additional Appropriations	-9.100	0.000	0.000	-	0.000
• Missile Defeat and Defense Enhancement	0.000	0.000	0.000	-	0.000
• Other Adjustment	0.000	0.000	-19.566	-	-19.566

## Change Summary Explanation

Reduction to Directed Energy efforts in FY 2019 from PB18 to PB19 reflects a realignment of funds to continue focus on increasing BMD system reliability to build Warfighter confidence.

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency										Date: February 2018		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>				Project (Number/Name) MD98 / <i>Directed Energy Demonstrator Development</i>			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
MD98: <i>Directed Energy Demonstrator Development</i>	-	14.265	48.099	61.317	-	61.317	66.266	60.697	70.704	72.040	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

## Note

N/A

## A. Mission Description and Budget Item Justification

The Directed Energy Demonstrator Development project develops, integrates, and tests the technologies required to demonstrate the complete acquisition, tracking and lethality engagement sequence of a high energy laser system for boost-phase missile defense. The LPLD focuses on integrating the lasers, detectors, beam control system, processors, power supplies and thermal management systems into a high altitude airborne platform for missile defense laser applications. MDA will test the laser platform under realistic conditions in conjunction with on-going BMDS tests.

This approach informs a missile defense laser concept of operations under realistic BMDS scenarios. The Directed Energy Demonstrator Development project provides the necessary technology, test data, and operations familiarity to successfully transition to a higher power directed energy weapon capable of destroying a boosting missile before payloads deploy, complicating kill.

The technology, individually and jointly developed and tested by MDA, the Air Force and the Defense Advanced Research Projects Agency under the Weapons Technology program element, underpins multiple LPLD industry concepts. This LPLD provides additional collaborative development and test opportunities to investigate laser beam pointing, stability and jitter effects under various altitude and flight conditions.

This project also continues investments started under the Weapons Technology PE to demonstrate 30 kilowatt-class high efficiency; compact, electric laser scaling, to include Diode Pump Alkali Laser and Fiber Combining Laser technology, required to inform future high power laser systems.

## B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
<b>Title:</b> Directed Energy Demonstrator Development	14.265	48.099	61.317
<b>Articles:</b>	-	-	-
<b>Description:</b> The Directed Energy Demonstrator Development project designs, integrates, and tests a Low Power Laser Demonstrator (LPLD) for missile defense. Depending on the specific industry initial design selected to continue through critical design, the demonstrator will consist of a kilowatt (kW)-class tracking laser, a multi-kilowatt class mission laser and a 0.5 meter telescope. A key risk area to cost effective boost phase kill is acquisition, tracking and beam stability at long stand-off ranges.			

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<b>Appropriation/Budget Activity</b> 0400 / 4		<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>		<b>Project (Number/Name)</b> MD98 / <i>Directed Energy Demonstrator Development</i>	
<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>			<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
<p>The demonstrator will incrementally verify acquisition and tracking, laser pointing and stability accuracy at extended ranges, then mission laser effectiveness at shorter ranges.</p> <p>The LPLD provides an autonomously controlled laser-equipped airborne platform to develop a missile defense directed energy Concept of Operations (CONOPS). The laser flight system, beam control methodology and laser CONOPS inform development of higher power, higher altitude directed energy systems necessary for missile defense.</p> <p>This project also develops laser technology with demonstrated abilities to scale to the high power levels required for missile defense.</p> <p>Specific and/or unique accomplishments to each FY are as follows:</p> <p><b>FY 2018 Plans:</b></p> <p>The increase from FY 2017 to FY 2018 funds the ramp up in Industry personnel required to transition from the initial design phase to full demonstrator development and purchase of long lead hardware required to build and test a LPLD based on the cost and schedule provided during industry's concept definition studies.</p> <p>Complete the systems engineering and preliminary design for the LPLD that integrates the lasers, detectors, beam control system, processors, power supplies and thermal management systems into an airborne platform for missile defense.</p> <ul style="list-style-type: none"> <li>- Complete the initial design through Preliminary Design Review (PDR)</li> <li>-- Complete LPLD requirements flow down and engineering analysis</li> <li>-- Define long lead procurement requirements</li> <li>-- Conduct PDR</li> <li>- Select the best laser/aircraft design to demonstrate pointing and tracking, beam control and lethality.</li> <li>- Award a follow-on contract for continued development through a tailored Critical Design Review (CDR) and begin long lead material procurement</li> <li>-- Complete long lead build to drawings and release for fabrication</li> <li>-- Refine the directed energy concept of operations for laser equipped high altitude airborne platforms</li> </ul> <p><b>FY 2019 Plans:</b></p> <p>Begin the comprehensive LPLD design work, taking a single contractor from an FY 2018 initial design, to an FY 2019 end-to-end system level blueprint for construction. This includes funding for manufacturing long-lead items, sub component procurement, integration and testing, as well as software development efforts.</p> <ul style="list-style-type: none"> <li>- Complete the design through a tailored Critical Design Review (CDR)</li> <li>-- Complete final engineering analysis</li> </ul>					

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<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>										<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
<ul style="list-style-type: none"> <li>-- Complete test planning requirements</li> <li>-- Complete beam control, laser, and platform interface drawings</li> <li>-- Conduct CDR</li> <li>- Procure long lead hardware and begin fabrication</li> <li>Incrementally develop scalable, efficient, and compact high-energy laser components for integration into high power systems.</li> <li>-- Demonstrate robust high power diodes</li> <li>- Complete Lawrence Livermore National Laboratory demonstration of a next generation diode pumped alkali laser architecture.</li> <li>-- Complete MIT Lincoln Laboratory Fiber Combining Laser architecture low Size, Weight and Power (SWaP) diode pump assembly</li> </ul>												
<b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> The increase from FY 2018 to FY 2019 reflects the additional technical and engineering support required to progress from PDR to CDR and procure long lead materials for LPLD.												
<b>Accomplishments/Planned Programs Subtotals</b>										14.265	48.099	61.317
<b>C. Other Program Funding Summary (\$ in Millions)</b>												
<b>Line Item</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019 Base</b>	<b>FY 2019 OCO</b>	<b>FY 2019 Total</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	
• 0603176C: <i>Advanced Concepts and Performance Assessment</i>	14.534	12.996	13.017	-	13.017	14.267	14.899	15.235	16.224	Continuing	Continuing	
• 0603178C: <i>Weapons Technology</i>	47.403	5.495	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing	
• 0603180C: <i>Advanced Research</i>	27.185	20.184	20.365	-	20.365	20.778	21.194	21.652	22.036	Continuing	Continuing	
<b>Remarks</b>												
<b>D. Acquisition Strategy</b> The acquisition strategy for MD98, Directed Energy Development, consists of contracts to industry via the Advanced Technology Innovation Broad Agency Announcement and competitive procurement(s) and agreements with Federally Funded Research and Development Centers to develop and demonstrate a LPLD system in realistic test environments. MDA will leverage agency partner subject matter experts and use government model based assessments for Better Buying Power 3.0 philosophy acquisition decisions.												
<b>E. Performance Metrics</b> N/A												

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MD98 / <i>Directed Energy Demonstrator Development</i>			
<b>Product Development (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - High Bandwidth Communications	MIPR	SAF/FMBIB Air Force : Washington DC	0.000	3.500	Jun 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - LPLD Design and Fab	C/CPFF	TBD : TBD	0.000	0.000		16.175	May 2018	49.407	Oct 2018	-		49.407	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - LPLD Preliminary Design A	C/CPFF	Lockheed Martin : CA	0.000	3.588	Jul 2017	9.000	Nov 2017	0.000		-		0.000	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - LPLD Technology Transfer/Laser Scaling	MIPR	MIT LL, LLNL : MA, CA	0.000	4.212	Sep 2017	0.000		4.750		-		4.750	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - LPLD-Preliminary Design B	C/CPFF	General Atomics : CA	0.000	1.000	Jul 2017	9.000	Nov 2017	0.000		-		0.000	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator	C/CPFF	Boeing : CA	0.000	0.000		9.000	Nov 2017	0.000		-		0.000	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MD98 / <i>Directed Energy Demonstrator Development</i>			
<b>Product Development (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Development - LPLD-Preliminary Design C															
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - Laser Lethality Demonstration	MIPR	WSMR, Lockheed Martin, RTC : NM, AL	0.000	0.370	Feb 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.000	12.670		43.175		54.157		-		54.157	Continuing	Continuing	N/A
<b>Remarks</b> N/A															
<b>Support (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - Advisory and Assistance Services	C/CPFF	MDA Multi : AL, NM	0.000	0.000		0.000		1.343	Oct 2018	-		1.343	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - Civilian Salaries and Travel	Allot	MDA Multi : AL, NM	0.000	0.000		0.219	Oct 2017	0.224	Oct 2018	-		0.224	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - FFRDC	MIPR	Aerospace : AL	0.000	0.395		0.000		1.497	Oct 2018	-		1.497	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MD98 / <i>Directed Energy Demonstrator Development</i>			
<b>Support (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - Facility Support	MIPR	377th ABW : NM	0.000	0.000		0.000		0.134	Nov 2018	-		0.134	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - Facility Sustainment	C/CPFF	MDA Multi : AL, NM	0.000	0.000		0.000		0.193	Jun 2019	-		0.193	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - Information Technology	C/CPFF	Northrup Grumman : CO	0.000	0.000		0.000		0.359	Nov 2018	-		0.359	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - LPLD-Performance Analysis	MIPR	MIT LL, Aviation and Missile Research Development and Engineering Center (AMRDEC) : MA, AL	0.000	0.250	Jan 2017	2.556	Jan 2018	3.410	Oct 2018	-		3.410	Continuing	Continuing	Continuing
Directed Energy Demonstrator Development - Directed Energy Demonstrator Development - LPLD-Engineering and Technical Services	MIPR	Aviation and Missile Research Development and Engineering Center (AMRDEC) : AL	0.000	0.950	Oct 2016	2.149	Oct 2017	0.000		-		0.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.000	1.595		4.924		7.160		-		7.160	Continuing	Continuing	N/A
<b>Remarks</b> N/A															



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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency										<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4				<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>				<b>Project (Number/Name)</b> MD98 / <i>Directed Energy Demonstrator Development</i>					
	<b>Prior Years</b>	<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>	0.000	14.265		48.099		61.317		-		61.317	Continuing	Continuing	N/A
<b>Remarks</b> N/A													

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Missile Defense Agency														Date: February 2018																														
Appropriation/Budget Activity 0400 / 4														R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives														Project (Number/Name) MD98 / Directed Energy Demonstrator Development																
Significant Event Complete ▲ Significant Event Planned △				Milestone Decision Complete ★ Milestone Decision Planned ☆				Element Test Complete ◆ Element Test Planned ◇				System Level Test Complete ● System Level Test Planned ○				Complete Activity ◆ Planned Activity ◇																												
								FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023												
LPLD Contract Awards																		△																										
LPLD tailored PDR																				△																								
LPLD tailored CDR																								△																				
Laser Scaling Demonstration																								△																				
LPLD Flight Laser Complete																														△														
LPLD Checkout Ground Test																																△												
LPLD Checkout Flight Test																																		△										
Target Acquisition and Tracking Demonstration																																			△									
Laser Concept of Operations																																				△								
Beam Control and Stability Demonstration FEV-03																																						△						
Beam Control and Stability Demonstration FEV-04																																								△				
Beam Control and Stability Demonstration FEV-05																																										△		
High Power Laser Demonstrator Contract Award																																									△			

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2019 Missile Defense Agency			<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>	<b>Project (Number/Name)</b> MD98 / <i>Directed Energy Demonstrator Development</i>	

**Schedule Details**

<b>Events</b>	<b>Start</b>		<b>End</b>	
	<b>Quarter</b>	<b>Year</b>	<b>Quarter</b>	<b>Year</b>
LPLD Contract Awards	4	2017	4	2017
LPLD tailored PDR	3	2018	3	2018
LPLD tailored CDR	4	2019	4	2019
Laser Scaling Demonstration	4	2019	4	2019
LPLD Flight Laser Complete	3	2021	3	2021
LPLD Checkout Ground Test	1	2022	1	2022
LPLD Checkout Flight Test	3	2022	3	2022
Target Acquisition and Tracking Demonstration	4	2022	4	2022
Laser Concept of Operations	4	2022	4	2022
Beam Control and Stability Demonstration FEV-03	1	2023	1	2023
Beam Control and Stability Demonstration FEV-04	2	2023	2	2023
Beam Control and Stability Demonstration FEV-05	3	2023	3	2023
High Power Laser Demonstrator Contract Award	3	2023	3	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency										Date: February 2018		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives				Project (Number/Name) MD99 / Discrimination Sensor Demonstrator Development			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
MD99: Discrimination Sensor Demonstrator Development	18.362	56.988	73.295	78.608	-	78.608	94.217	74.068	66.263	94.528	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

N/A

**A. Mission Description and Budget Item Justification**

Discrimination Sensor Demonstrator Development (DSDD), areas of concentration include tracking lasers, advanced detectors, infrared sensors, and precision tracking and discrimination algorithms. DSDD demonstrates precision track of advanced threats at extended ranges, simple scene discrimination and then complex scene discrimination through ground, flight, and space demonstrations.

This project develops and tests high-precision advanced sensors to improve identifying, acquiring, tracking and discriminating incoming ballistic missile threats, specifically addressing U.S. Strategic Commands Prioritized Capabilities List requirements. DSDD enhances the BMDS capability to discriminate lethal objects in a threat cluster, and track and hand over the threat object with Aegis Launch on Remote and Engage on Remote precision. The increased kinematics envelope of the SM-3 Block IIA, when combined with Engage on Remote capability, will expand battlespace and increase the number of threats engaged.

This project funds development of next-generation advanced sensor systems to include tracking lasers, specialized detectors, and unique processors and the corollary ground, airborne and space subsystems. These advanced sensors operate at the strategic ranges required to augment BMDS radar, improve the BMDS discrimination capability and provide precision track of large raids. They also track multiple targets simultaneously, substantially reducing the number of sensor assets required for large raids.

MDA tests promising advanced sensor technology at the Mt Wilson Aerospace Facility for Integrated Optical Test (MAFIOT) in conjunction with BMDS tests. The MAFIOT ground testbed provides line of sight viewing of missile launches from Vandenberg AFB and San Nicolas Island. Additionally, MDA will use a transportable ground testbed to test advanced sensors at the Pacific Missile Range Facility (PMRF).

This project includes advanced sensor integration into a high altitude airborne platform, a MDA Configured MQ-9 aircraft, and testing in operationally relevant environments. The MDA Configured MQ-9 aircraft equipped with an advanced sensor provides the MDA a viable quick reaction capability to augment BMDS radar.

The program will leverage the technology demonstrated from the ground and in the air to develop space qualified advanced sensor technology. These cost-effective focal plane array and advanced sensor space components inform future BMDS space layer decisions for persistent tracking and discrimination.

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency			Date: February 2018		
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives	Project (Number/Name) MD99 / Discrimination Sensor Demonstrator Development		
MDA will also partner with the Services to develop concepts for the cost effective integration of the sensor technology into limited fielding upgrade kits. The concept information will inform a MDA Product Development Decision for further development and/or limited fielding decisions. These kits could be installed on MQ-9 aircraft deployed in theater to add missile defense capabilities on short notice.					
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)			FY 2017	FY 2018	FY 2019
Title: Discrimination Sensor Demonstrator Development			56.988	73.295	78.608
Articles:			-	-	-
Description: This project develops an advanced sensor system (tracking laser, advanced detector, infrared sensor, and precision tracking and discrimination algorithms) for participation in BMDS tests under operationally relevant conditions and at operationally relevant ranges. The sensors upgrade will provide capability for tracking and discrimination of lethal objects. Specific and/or unique accomplishments to each FY are as follows:					
FY 2018 Plans: The increase from FY 2017 to FY 2018 reflects Discrimination Sensor continued build, aircraft integration, and flight qualification. - Continue development of the advanced sensor system to include the laser, detector, and unique advanced processor - Conduct missile boost-phase tracking tests with advanced sensor ground testbed -- Develop and improve algorithms and models based on data from advanced sensor ground testbeds -- Conduct airborne advanced sensor ground-truth tests with ground testbed -- Conduct advanced sensor risk reduction tests at ground testbeds - Conduct a flight laboratory test for a compact combined advanced sensor - Complete build and begin integration of a flight qualified laser system onto a MQ-9 aircraft - Solicit a Broad Agency Announcement for advanced sensor for space concept definition					
FY 2019 Plans: - Complete missile tracking tests with advanced sensor ground testbeds at MAFIOT and PMRF - Transition algorithms and models based on data from advanced sensor ground testbeds to the flight system - Complete development of an advanced sensor system to include the laser, detector and unique advanced processor - Complete integration of flight qualified advanced sensor system components onto a MQ-9 aircraft - Conduct first flight test of the advanced sensor system on a MQ-9 aircraft					
FY 2018 to FY 2019 Increase/Decrease Statement: The increase from FY 2018 to FY 2019 reflects flight qualification efforts leading to Advanced Sensor flight test.					
Accomplishments/Planned Programs Subtotals			56.988	73.295	78.608

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency										Date: February 2018		
Appropriation/Budget Activity 0400 / 4				R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives				Project (Number/Name) MD99 / Discrimination Sensor Demonstrator Development				
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost	
• 0603176C: Advanced Concepts and Performance Assessment	14.534	12.996	13.017	-	13.017	14.267	14.899	15.235	16.224	Continuing	Continuing	
• 0603178C: Weapons Technology	47.403	5.495	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing	
• 0603179C: Advanced C4ISR	3.489	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.489	
• 0603180C: Advanced Research	27.185	20.184	20.365	-	20.365	20.778	21.194	21.652	22.036	Continuing	Continuing	
• 0603884C: Ballistic Missile Defense Sensors	252.665	278.145	220.876	-	220.876	250.238	267.502	263.758	260.273	Continuing	Continuing	
• 0603890C: BMD Enabling Programs	435.203	465.642	540.926	-	540.926	542.326	608.210	489.637	496.313	Continuing	Continuing	
• 0603896C: Ballistic Missile Defense Command and Control, Battle Management & Communication	465.433	454.862	475.168	-	475.168	515.239	494.873	492.119	515.529	Continuing	Continuing	
Remarks												
D. Acquisition Strategy												
The acquisition strategy for MD99, Discrimination Sensor Demonstrator Development consists of a contract(s) to industry via the Advanced Technology Innovation Broad Agency Announcement and competitive procurements and agreements with Federally Funded Research and Development Centers to develop and demonstrate an advanced sensor system in realistic test environments. MDA will leverage agency partner subject matter experts and use government model based assessments for Better Buying Power 3.0 philosophy acquisition decisions.												
E. Performance Metrics												
N/A												

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MD99 / <i>Discrimination Sensor Demonstrator Development</i>			
<b>Product Development (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Advanced Sensor Development Support	MIPR	Aerospace, MIT/LL : CA, MA	0.436	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Advanced Sensor Flight Demonstrator	Various	General Atomics, MIT/LL, TBD : C, MA, TBD	0.000	4.209		53.423	Aug 2018	54.464	Oct 2018	-		54.464	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Advanced Sensor Ground Test	MIPR	MIT LL, Aerospace : MA, CA	8.698	6.375		1.673	Oct 2017	5.414	Oct 2018	-		5.414	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Advanced Sensor Laboratory Test	C/CPFF	General Atomics : CA	1.655	6.455		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Advanced	MIPR	MIT LL : MA	0.500	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MD99 / <i>Discrimination Sensor Demonstrator Development</i>			
<b>Product Development (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Sensor Performance Analysis Aegis Engage on Remote Concept Assessment															
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Advanced Sensor Performance Analysis Aegis Engage on Remote Hardware in the Loop (HWIL)	MIPR	MIT LL, Aviation and Missile Research, Development, and Engineering Center (AMRDEC) : MA, AL	0.000	5.663		6.100	Nov 2017	5.500	Oct 2018	-		5.500	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Airborne EO/IR Demonstrator	Various	General Atomics, SMDC, SPAWAR : CA, AL	1.708	20.285		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - High Bandwidth Communications	MIPR	SAF/FMBIB Air Force : Washington DC	0.000	6.689	Jun 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			12.997	49.676		61.196		65.378		-		65.378	Continuing	Continuing	N/A
<b>Remarks</b> N/A															



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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MD99 / <i>Discrimination Sensor Demonstrator Development</i>			
<b>Support (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Agency Operations - Advisory and Assistance Services	C/CPFF	Various : NM, AL	0.241	1.432		3.164	Oct 2017	2.930	Oct 2018	-		2.930	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Agency Operations - Engineering and Technical Services	MIPR	Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Aerospace : AL, CA	1.198	1.071		0.811	Oct 2017	1.560	Oct 2018	-		1.560	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Agency Operations - Civilian Salaries and Travel	Allot	MDA Multi : AL, NM	1.366	2.407		4.804	Oct 2017	5.464	Oct 2018	-		5.464	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination Sensor Demonstrator Development - Agency Operations - Facility Support	MIPR	377th ABW : NM	0.148	0.163		0.113	Oct 2017	0.000		-		0.000	Continuing	Continuing	Continuing
Discrimination Sensor Demonstrator Development - Discrimination	C/CPAF	Northrop Grumman : CO	2.412	2.239		3.207	Feb 2018	3.276	Oct 2018	-		3.276	Continuing	Continuing	Continuing

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>				<b>Project (Number/Name)</b> MD99 / <i>Discrimination Sensor Demonstrator Development</i>					

  

Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Sensor Demonstrator Development - Information Management and Technology															
<b>Subtotal</b>			5.365	7.312		12.099		13.230		-		13.230	Continuing	Continuing	N/A

  

<b>Remarks</b> N/A															
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	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	18.362	56.988	73.295	78.608	-	78.608	Continuing	Continuing	N/A

  

<b>Remarks</b> N/A									
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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Missile Defense Agency														Date: February 2018															
Appropriation/Budget Activity 0400 / 4										R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives										Project (Number/Name) MD99 / Discrimination Sensor Demonstrator Development									
Significant Event Complete ▲ Significant Event Planned △					Milestone Decision Complete ★ Milestone Decision Planned ☆					Element Test Complete ◆ Element Test Planned ◇					System Level Test Complete ● System Level Test Planned ○					Complete Activity ◆ Planned Activity ◇									
										FY 2017		FY 2018		FY 2019		FY 2020		FY 2021		FY 2022		FY 2023							
Advanced Sensor PDR										▲																			
Advanced Sensor CDR											▲																		
Electro Optical Infrared Launch on Remote Track Ex												△																	
Advanced Sensor Flight Laboratory Test													△																
Advanced Sensor System Ground Test													△																
Advanced Sensor CONUS Flight Test																△													
Space Advanced Sensor Contract Award																△													
Space Advanced Sensor Competitive Design																	△												
Advanced Sensor Live Fire Track Ex																		△											
Advanced Sensor Launch on Remote Test																			△										
Space Advanced Sensor CDR																				△									
Advanced Sensor Discrimination Upgrades																					△								
Advanced Sensor Discrimination Flight Test																								○					

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2019 Missile Defense Agency			<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>	<b>Project (Number/Name)</b> MD99 / <i>Discrimination Sensor Demonstrator Development</i>	

**Schedule Details**

<b>Events</b>	<b>Start</b>		<b>End</b>	
	<b>Quarter</b>	<b>Year</b>	<b>Quarter</b>	<b>Year</b>
Advanced Sensor PDR	1	2017	1	2017
Advanced Sensor CDR	3	2017	3	2017
Electro Optical Infrared Launch on Remote Track Ex	4	2017	4	2017
Advanced Sensor Flight Laboratory Test	1	2018	1	2018
Advanced Sensor System Ground Test	1	2018	1	2018
Advanced Sensor CONUS Flight Test	4	2019	4	2019
Space Advanced Sensor Contract Award	1	2020	1	2020
Space Advanced Sensor Competitive Design	4	2020	4	2020
Advanced Sensor Live Fire Track Ex	2	2021	2	2021
Advanced Sensor Launch on Remote Test	4	2021	4	2021
Space Advanced Sensor CDR	4	2021	4	2021
Advanced Sensor Discrimination Upgrades	3	2022	3	2022
Advanced Sensor Discrimination Flight Test	3	2023	3	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency										Date: February 2018		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives				Project (Number/Name) MT99 / Technology Maturation Initiatives Test			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
MT99: Technology Maturation Initiatives Test	2.070	8.434	0.220	1.982	-	1.982	4.285	1.839	0.000	0.000	0.000	18.830
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Note N/A												
A. Mission Description and Budget Item Justification Technology Maturation Initiatives (TMI) test project funds the management and execution of TMI system participation in BMDS level tests, hardware-in-the-loop testing, and performance analysis costs for flight test data. This includes test asset shipment to test ranges, labor, travel, range support, and Command Control Battle Management and Communications test support specific to TMI.												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)									FY 2017	FY 2018	FY 2019	
<b>Title:</b> Technology Maturation Initiatives Test  <b>Articles:</b>  <b>Description:</b> This project captures the cost to test the systems developed under the Directed Energy Demonstrator Development and Discrimination Sensor Demonstrator Development projects under realistic conditions in conjunction with on-going BMDS testing and through dedicated live fire tests to inform continued testing, full development and limited fielding decisions. This effort also demonstrates potential sensors, systems, and architectures to integrate the BMDS for left and right of launch. Specific and/or unique accomplishments to each FY are as follows:  <b>FY 2018 Plans:</b> - Complete residual support and data analysis for FEV-01 and FE-01  <b>FY 2019 Plans:</b> - Conduct system level hardware-in-the-loop testing in conjunction with Enterprise Sensor Laboratory and Experimental Laboratory for a BMDS level test - Shipping, labor, travel, and range support for a BMDS level test  <b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> The increase from FY 2018 to FY 2019 reflects advanced sensor participation in a BMDS test.									8.434	0.220	1.982	
									-	-	-	
Accomplishments/Planned Programs Subtotals									8.434	0.220	1.982	

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency									Date: February 2018		
Appropriation/Budget Activity 0400 / 4				R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives				Project (Number/Name) MT99 / Technology Maturation Initiatives Test			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• 0603176C: Advanced Concepts and Performance Assessment	14.534	12.996	13.017	-	13.017	14.267	14.899	15.235	16.224	Continuing	Continuing
• 0603178C: Weapons Technology	47.403	5.495	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• 0603179C: Advanced C4ISR	3.489	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.489
• 0603180C: Advanced Research	27.185	20.184	20.365	-	20.365	20.778	21.194	21.652	22.036	Continuing	Continuing
• 0603884C: Ballistic Missile Defense Sensors	252.665	278.145	220.876	-	220.876	250.238	267.502	263.758	260.273	Continuing	Continuing
• 0603890C: BMD Enabling Programs	435.203	465.642	540.926	-	540.926	542.326	608.210	489.637	496.313	Continuing	Continuing
• 0603896C: Ballistic Missile Defense Command and Control, Battle Management & Communication	465.433	454.862	475.168	-	475.168	515.239	494.873	492.119	515.529	Continuing	Continuing
• 0603914C: Ballistic Missile Defense Test	294.441	316.193	365.681	-	365.681	349.388	320.909	320.332	327.584	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
The MDA Integrated Master Test Plan establishes and documents the test requirements for the BMDS with the specific focus on collecting the data needed for the Verification, Validation, and Accreditation of the BMDS models and simulations. This paradigm uses critical factor analysis to drive test design, planning, and execution for accrediting models & simulations, which is used to validate and assess system performance. With this test approach, the MDA will establish confidence that the models & simulations used to evaluate the BMDS represent real world behavior, thereby enabling simulation-based performance assessment to verify system functionality.											
E. Performance Metrics											
N/A											

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis: PB 2019 Missile Defense Agency</b>												<b>Date: February 2018</b>			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MT99 / <i>Technology Maturation Initiatives Test</i>			
<b>Product Development (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Technology Maturation Initiatives Test - Technology Maturation Initiative Test - Advanced Demonstration	MIPR	SAF/FMBIB Air Force : Washington DC	0.000	3.586	Jun 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.000	3.586		0.000		0.000		-		0.000	Continuing	Continuing	N/A
<b>Remarks</b> N/A															
<b>Support (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Subtotal</b>			-	-		-		-		-		-	-	-	N/A
<b>Remarks</b> N/A															
<b>Test and Evaluation (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Technology Maturation Initiatives Test - Technology Maturation Initiative Test - Command Control Battle Management and Communications/Aegis	Various	Northrop Grumman, Lockheed Martin, Space and Naval Warfare Center, National Air and Space Intelligence Center, Naval Surface Warfare Center Dahlgren Division : CO, CA, OH, VA	1.405	1.874	Apr 2017	0.220	Oct 2017	1.107	Nov 2018	-		1.107	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Missile Defense Agency												Date: February 2018			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>				Project (Number/Name) MT99 / <i>Technology Maturation Initiatives Test</i>					
Test and Evaluation (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Technology Maturation Initiatives Test - Technology Maturation Initiative Test - Range Facility Test Prep	MIPR	Pacific Missile Range Facility, Edwards AFB : HI, CA	0.000	0.274		0.000		0.128	Jan 2019	-		0.128	Continuing	Continuing	Continuing
Technology Maturation Initiatives Test - Technology Maturation Initiative Test - Reagan Test Site Prep	MIPR	Reagan Test Site : Kwajalein Atoll	0.000	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Technology Maturation Initiatives Test - Technology Maturation Initiative Test - Transportation Costs for MQ-9	MIPR	US Air Force : CA	0.665	2.700		0.000		0.747	Jan 2019	-		0.747	Continuing	Continuing	Continuing
Subtotal			2.070	4.848		0.220		1.982		-		1.982	Continuing	Continuing	N/A
Remarks N/A															
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			2.070	8.434		0.220		1.982		-		1.982	Continuing	Continuing	N/A
Remarks N/A															



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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Missile Defense Agency															Date: February 2018														
Appropriation/Budget Activity 0400 / 4										R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives										Project (Number/Name) MT99 / Technology Maturation Initiatives Test									
Significant Event Complete ▲					Milestone Decision Complete ★					Element Test Complete ◆					System Level Test Complete ●					Complete Activity ◆									
Significant Event Planned △					Milestone Decision Planned ☆					Element Test Planned ◇					System Level Test Planned ○					Planned Activity ◇									
										FY 2017		FY 2018		FY 2019		FY 2020		FY 2021		FY 2022		FY 2023							
IMTP v19.1 flight and ground test event details are at a higher classification.										◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇						

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Missile Defense Agency		Date: February 2018
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives	Project (Number/Name) MT99 / Technology Maturation Initiatives Test

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
IMTP v19.1 flight and ground test event details are at a higher classification.	1	2017	4	2023

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency										Date: February 2018		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives				Project (Number/Name) MC98 / Cyber Operations			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
MC98: Cyber Operations	0.140	0.331	0.172	0.254	-	0.254	0.177	0.180	0.270	0.275	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Note N/A												
A. Mission Description and Budget Item Justification												
Cyber Operations sustains the MDA DoD Risk Management Framework and Controls Validation Testing activities, analysis of validation results, risk assessments and reviews of proposed Program Manager/Information Assurance Manager Plans of Action and Milestones for the MDA Discrimination Sensor Technology mission systems. It maintains the Certification and Accreditation data repository, capturing the DoD Information Assurance Certification and Accreditation Program documentation (artifacts, validation results, and Information Assurance Risk Assessment results, and Designated Approving Authority accreditation decisions) and Plans of Action and Milestones on all MDA information systems.												
This project monitors and tracks Cybersecurity mitigations detailed in Information Technology security Plans of Action and Milestones. Activities include preparation of Certification and Accreditation documentation and accreditation recommendations to the MDA Senior Information Assurance Officer /Certification Authority and Designated Approving Authority. Independent Verification and Validation team actions ensure the availability, integrity, authentication, confidentiality and non-repudiation of the MDA mission, test and administrative systems. Activities in the project are necessary to comply with the Federal Information Security Management Act.												
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)									FY 2017	FY 2018	FY 2019	
Title: Network / System Certification and Accreditation (C and A)									0.331	0.172	0.254	
Articles:									-	-	-	
Description: This project sustains the MDA DoD Risk Management Framework (RMF) certification and Controls Validation Testing activities for Technology Maturation Initiatives (TMI).												
- Conduct cyber security and information assurance engineering and architecture planning for TMI information technology systems												
- Plan and test the information assurance controls for Ballistic Missile Defense System TMI systems												
- Develop TMI DoD RMF certification and accreditation packages												
- Conduct controls validation testing for TMI mission systems and provide Plan of Action and Milestones to mitigate information assurance deficiencies												
- Conduct annual information assurance reviews on the TMI enclaves to assess compliance in implementing and maintaining Information Assurance controls												
Specific and/or unique accomplishments to each FY are as follows:												

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2019 Missile Defense Agency								<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4				<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>				<b>Project (Number/Name)</b> MC98 / <i>Cyber Operations</i>			

  

<b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
<b><i>FY 2018 Plans:</i></b> - SEE ABOVE.			
<b><i>FY 2019 Plans:</i></b> - SEE ABOVE.			
<b><i>FY 2018 to FY 2019 Increase/Decrease Statement:</i></b> The increase in FY 2019 from FY 2018 reflects the need for Information Assurance Controls Validation Testing recertification every three years.			
<b>Accomplishments/Planned Programs Subtotals</b>	0.331	0.172	0.254

  

<b>C. Other Program Funding Summary (\$ in Millions)</b>											
<u>Line Item</u>	<u>FY 2017</u>	<u>FY 2018</u>	<u>FY 2019</u> <u>Base</u>	<u>FY 2019</u> <u>OCO</u>	<u>FY 2019</u> <u>Total</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 0603176C: <i>Advanced Concepts and Performance Assessment</i>	14.534	12.996	13.017	-	13.017	14.267	14.899	15.235	16.224	Continuing	Continuing
• 0603178C: <i>Weapons Technology</i>	47.403	5.495	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• 0603179C: <i>Advanced C4ISR</i>	3.489	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.489
• 0603180C: <i>Advanced Research</i>	27.185	20.184	20.365	-	20.365	20.778	21.194	21.652	22.036	Continuing	Continuing
<b>Remarks</b>											
<b>D. Acquisition Strategy</b>											
The acquisition strategy for MC98, Cyber Operations, consists of using MDA civilian employees and the existing competitively awarded contractor support services.											
<b>E. Performance Metrics</b>											
N/A											

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<b>Exhibit R-3, RDT&amp;E Project Cost Analysis:</b> PB 2019 Missile Defense Agency												<b>Date:</b> February 2018			
<b>Appropriation/Budget Activity</b> 0400 / 4						<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>						<b>Project (Number/Name)</b> MC98 / <i>Cyber Operations</i>			
<b>Support (\$ in Millions)</b>				<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>			
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
Network / System Certification and Accreditation (C and A) - Network / System Certification and Accreditation (C and A) - Agency Operations - Civilian Salaries and Travel	Allot	Missile Defense Agency : NM	0.140	0.000		0.172	Oct 2017	0.254		-		0.254	Continuing	Continuing	Continuing
Network / System Certification and Accreditation (C and A) - Network / System Certification and Accreditation (C and A) - CDS Implementation	C/CPFF	Northrop Grumman : CO	0.000	0.331	Apr 2017	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
<b>Subtotal</b>			0.140	0.331		0.172		0.254		-		0.254	Continuing	Continuing	N/A
<b>Remarks</b> N/A															
			<b>Prior Years</b>	<b>FY 2017</b>		<b>FY 2018</b>		<b>FY 2019 Base</b>		<b>FY 2019 OCO</b>		<b>FY 2019 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Project Cost Totals</b>			0.140	0.331		0.172		0.254		-		0.254	Continuing	Continuing	N/A
<b>Remarks</b> N/A															

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PE 0604115C: *Technology Maturation Initiatives*  
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Appropriation/Budget Activity 0400 / 4				R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives												Project (Number/Name) MC98 / Cyber Operations															
Significant Event Complete ▲ Significant Event Planned △				Milestone Decision Complete ★ Milestone Decision Planned ☆				Element Test Complete ◆ Element Test Planned ◇				System Level Test Complete ● System Level Test Planned ○				Complete Activity ♦ Planned Activity ◇															
				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023			
Cyber Security Support				◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇		
Controls Validation Certification 1																															
Controls Validation Certification 2																											△				

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2019 Missile Defense Agency			<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>	<b>Project (Number/Name)</b> MC98 / <i>Cyber Operations</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Cyber Security Support	1	2017	4	2021
Controls Validation Certification 1	3	2019	3	2019
Controls Validation Certification 2	3	2022	3	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2019 Missile Defense Agency										Date: February 2018		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604115C / <i>Technology Maturation Initiatives</i>				Project (Number/Name) MD40 / <i>Program Wide Support</i>			
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
MD40: <i>Program Wide Support</i>	4.171	4.496	6.620	6.661	-	6.661	7.478	6.456	6.701	7.927	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

Program Wide Support (PWS) reflects proportional changes as a result of changes in Technology Maturation Initiatives program element. Funding in the All Prior Years column represents a summary of Prior Years Total Costs for active contracts, Military Interdepartmental Purchase Requests on the R-3.

**A. Mission Description and Budget Item Justification**

PWS contains non-headquarters management costs in support of MDA functions and activities across the entire BMDS. It Includes Government Civilians and Contract Support Services. This provides integrity and oversight of the BMDS as well as supports MDA in the development and evaluation of technologies that will respond to the changing threat. Additionally, PWS includes Global Deployment personnel and support performing deployment site preparation and activation, and provides facility capabilities for MDA Executing Agent locations. Other MDA wide costs includes: physical and technical security; civilian drug testing; audit readiness; the Science, Technology, Engineering, and Mathematics (STEM) program; legal services and settlements; travel and agency training; office, equipment, vehicle, and warehouse leases; utilities and base operations; data and unified communications support; supplies and maintenance; materiel and readiness and central property management of equipment; and similar operating expenses. PWS is allocated on a pro-rata basis and therefore, fluctuates by year based on the adjusted RDT&E profile (which excludes: 0305103C Cyber Security Initiative, 0603274C Special Programs, 0603913C Israeli Cooperative Program and 0901598C Management Headquarters).

**B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)**

	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>
<b>Title:</b> Program Wide Support	4.496	6.620	6.661
<b>Articles:</b>	-	-	-
<b>Description:</b> N/A			
<b>FY 2018 Plans:</b> N/A			
<b>FY 2019 Plans:</b> N/A			
<b>FY 2018 to FY 2019 Increase/Decrease Statement:</b> N/A			
<b>Accomplishments/Planned Programs Subtotals</b>	4.496	6.620	6.661



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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2019 Missile Defense Agency		<b>Date:</b> February 2018
<b>Appropriation/Budget Activity</b> 0400 / 4	<b>R-1 Program Element (Number/Name)</b> PE 0604115C / <i>Technology Maturation Initiatives</i>	<b>Project (Number/Name)</b> MD40 / <i>Program Wide Support</i>
<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A		
<b>Remarks</b>		
<b>D. Acquisition Strategy</b> N/A		
<b>E. Performance Metrics</b> N/A		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Missile Defense Agency												Date: February 2018			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives				Project (Number/Name) MD40 / Program Wide Support					
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Wide Support - Agency Operations Management	Allot	Various : Multi: AL, VA	0.000	0.091	Jul 2017	0.132	Jul 2018	0.101	Jul 2019	-		0.101	Continuing	Continuing	Continuing
Program Wide Support - Agency Operations and Support Services	C/CPFF	Various : Multi: AL, VA	4.171	4.405	Aug 2017	6.488	Aug 2018	6.560	Jun 2019	-		6.560	Continuing	Continuing	Continuing
Subtotal			4.171	4.496		6.620		6.661		-		6.661	Continuing	Continuing	N/A
Remarks N/A															
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			4.171	4.496		6.620		6.661		-		6.661	Continuing	Continuing	N/A
Remarks N/A															

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PE 0604115C: *Technology Maturation Initiatives* **UNCLASSIFIED**  
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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Missile Defense Agency			Date: February 2018
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604115C / Technology Maturation Initiatives	Project (Number/Name) MD40 / Program Wide Support	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
MD40 Program-Wide Support	1	2017	4	2023